1.0 INTRODUCTION

This stormwater Field Sampling Plan (FSP) presents the approach and procedures to implement stormwater sampling activities in early 2007 for the Remedial Investigation and Feasibility Study (RI/FS) of the Portland Harbor Superfund Site (Site). Monitoring to be performed under this FSP will include whole-water and in-line sediments sampling of stormwater. The whole-water samples will be analyzed for target analytes selected from the list of problem chemicals identified in the AOC, including total suspended solids (TSS) and associated conventional parameters (e.g., hardness and pH). The in-line sediment samples will be analyzed for the target analytes, including total solids, grain size, and TOC. A complete listing of analytes, including analytical methods and reporting limits, is provided in Section ___ and Tables ____.

The RI/FS project is currently conducting Round 3A of sampling for various purposes in the Willamette River (River), which will extend well into 2007; therefore, this stormwater sampling is considered part of the Round 3A sampling.

1.1 BACKGROUND AND CONTEXT

Surface water contaminants are suspected to contribute to fish tissue burdens (and related risks) in the Site study area. The importance of various sources of surface water chemicals, particularly stormwater, is not well understood. This lack of understanding could make it difficult to accurately determine sediment (and water) preliminary remediation goals (PRGs) that are intended to minimize fish tissue related risks for the site. Thus, it is necessary to determine the relative contribution of stormwater (as compared to other sources) to surface water concentrations of selected contaminants.

Additionally, stormwater discharges have the potential to contribute to recontamination of sediments near outfalls (and/or potentially Site-wide for some chemicals) following cleanup when the discharge contains settleable solids with associated contaminants. The potential for this outcome must be assessed at an FS-appropriate level of detail to understand the general extent and need for stormwater source controls.

To understand the relative contribution of stormwater contaminants to fish tissue burdens and predict whether sediments would recontaminate at levels above PRGs eventually set for the site, estimates of stormwater loads are needed for inputs to estimation tools and models (i.e., Food-web model and Fate & Transport Model *or cite reference*).

Existing stormwater quality data for the Site study area are sporadic and relatively limited (Integral et al. 2004). Consequently, estimation of stormwater loads to the river based on existing data or literature values would be highly uncertain. Site-specific stormwater sampling is needed to support stormwater chemical loading estimates for input into the fate and transport model and other estimation tools that will be used to assess the data to understand the relative contribution of stormwater contaminants to fish tissue burdens and predict whether sediments would recontaminate at levels above PRGs eventually set for the site.

Since the draft RI report is due in spring 2008 this information needs to be collected in the 2006/2007 wet-weather season to prevent further slippage of the RI/FS schedule. Additional information may be collected by individual sites to supplement this effort and included in the final RI report.

As a result of the lack of information on the stormwater pathway, a Stormwater Technical Team (Team) comprised of representatives of the Environmental Protection Agency (EPA), Oregon Department of Environmental Quality (DEQ), and Lower Willamette Group (LWG) was established in November 2006. The recommendations of the Team (Koch et al., December 2006) were presented to the Portland Harbor Managers (also comprised of representatives of EPA, DEQ and LWG) in December 2006 and are the basis of this FSP.

1.2 SAMPLING PURPOSE AND OBJECTIVES

The purpose of this sampling and analysis effort is to evaluate the quality of stormwater discharges on sediment quality. The result of this effort will be used in an overall evaluation of source loadings to the Site study area to determine if 1) stormwater discharges are contributing to the ecological and human health risks; and 2) recontamination of the sediments following cleanup would be expected based on the current stormwater discharge rates.

The objectives of this sampling and analysis plan are:

- To provide an early indication of any water or sediment quality problems within the Site study area associated with stormwater discharges.
- Identify areas where sources of contaminants to the Site study area may be significant (e.g., contributing to risk or recontamination of the Site).
- Understand stormwater contribution to in-river fish tissue chemical burdens.

1.3 SUMMARY STORMWATER SAMPLING APPROACH

This FSP describes the approach for measuring the concentrations of contaminants in stormwater and for obtaining stormwater flow data at 31 select locations in the Site to meet the above objectives. These data will be used, in conjunction with estimation and evaluation tools described below, to assess the nature and extent of chemical loading from stormwater discharges to the site. In summary, the sampling approach involves:

1. Flow-weighted composite water samples from three design storm events (see Section 5.1.2.1) including whole water for organic compound analyses and filtered/unfiltered pairs for metals analyses.

2. One additional set of grab stormwater samples at 10 of the 31 sampling locations for sampling of filtered/unfiltered pairs and analysis of selected organic compounds.

3. Sediment trap deployment and sampling for a minimum duration of 3 months.

4. Continuous flow monitoring at each sampling site for the duration of the sampling effort.

1.4 DOCUMENT ORGANIZTION

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Successful completion of the sampling and analysis requires coordination and adherence to the FSP and QA/QC procedures. Staffing and responsibilities are outlined below; an organization chart is provided in Figure 4-1. The LWG will notify the Agencies if there are any changes in the project organization listed below.

2.1 PROJECT PLANNING AND COORDINATION

Project coordination is the responsibility of Carl Stivers, Anchor Environmental. Mr. Stivers is the primary project contact.

2.2 FIELD SAMPLE COLLECTION

Simon Page, Anchor Environmental, will oversee field activities, including sample location selection, sampling equipment installation, and sample collection. Mr. Page will direct the sampling teams when to activate the sampling equipment, assist in troubleshooting equipment problems, and be available to act as an alternate on the sampling teams.

The sampling teams will be lead by an Anchor water quality specialist familiar with the equipment operation. Each team will also have a specialist from Integral to oversee the collection, processing, and shipment of the samples to the laboratory. The team leader will have the responsibility to deploy and redeploy their automatic samplers as needed, activate their automatic samplers when notified of a storm meeting the sampling criteria is imminent, conduct collection the samples in a timely manner, download sampler storm event data, conduct or coordinate delivery of the samples to the LWG Field Laboratory, coordinate delivery of samples to the analytical laboratories, filling out all field forms and chain of custody forms, and ensure that all field work is conducted in accordance to the HSP (Integral 2004b).

The operations and maintenance team will be based in Portland and have responsibility to routinely inspect and repair the sediment traps, Isco samplers, and other equipment, calibrate flow meters and samplers as needed, download the flow data loggers, and rotate the batteries in the automatic samplers to ensure that they are ready at all times to initiate sampling. They may also deliver samples to the LWG Field Laboratory as needed.

The Field Laboratory Team will assist in the processing, tracking, and archiving of samples, maintain sample archives, conduct packing of coolers and filling out chain-of-custody forms for laboratory delivery, will coordinate with the laboratories for sample delivery and/or pickup, facilitate the tracking of samples, and coordinate with laboratories to ensure correct analyses following the QAPP addendum are conducted.

The laboratories used for the sampling program are listed in Table 2-5. The laboratories will be responsible for providing "certified clean" sample bottles and equipment to the sampling teams, coolers and packaging materials, labels, seals, and chain-of-custody forms. The laboratories will designate a project coordinator who will be responsible for receiving the samples from the field laboratory team and coordination of data reporting.

2.3 CHEMICAL ANALYSIS

The laboratories used for the sampling program are listed in Table 2-5. The samples will be analyzed for the analytes listed in Section ____ and Tables ________. The laboratory coordinator will also be responsible to ensure that the samples are analyzed according to the specified methodologies.

2.4 LABORATORY QA/QC MANAGEMENT

Name, Affiliation, will perform the QA/QC review of the data and produce the Quality Assurance Data Summary Package. *Name, Affiliation*, will provide final review of the Quality Assurance Data Summary Package, and will serve as the overall Quality Assurance Manager for the Project.

2.5 DATA MANAGEMENT AND ANALYSIS

Name, Affiliation, will supervise data management and statistical analysis of hydrologic, stormwater and in-line sediment data. *Name, Affiliation*, will provide oversight and final review of the technical evaluations.

2.7 FINAL REPORT

Name, Affiliation, will be responsible for assembling the Final Report describing sample locations; sampling, handling, and analytical methods; data reports including QA/QC chemistry and data validation, database management, statistical evaluations, and an evaluation of data results.

3.0 DATA QUALITY OBJECTIVES

4.0 SAMPLING LOCATIONS

In order to meet the objectives of this FSP, it was decided to sample at outfalls representative of land uses (i.e., residential, major transportation corridors, heavy industrial, light industrial and open space), outfalls with unique or unusual chemical sources, and outfalls from large drainage basins that have a mixture of land uses, rather than collect information from the ~300 individual stormwater sources which would be obtained for the purposes of source control. A list of the proposed stormwater sampling locations is provided in Table 2-1. These outfall locations are shown in Figures 2a-c. This data will be used to extrapolate to other stormwater outfalls within the Site study area and will provide sufficient information to meet the objectives of this FSP.

The sampling location for each outfall was selected to minimize the amount of extrapolation based on land use. Preference will given to sampling locations as close to the outfall discharge point as possible, while taking into account any physical limitations, and maintaining the approach of isolating certain land uses within a reasonable subset of the sampling locations. Similarly, where one location at or near a basin's discharge point can be sampled, this would be preferred to extrapolating loads based on land use from many other sampling points outside the basin.

All sampling equipment will be deployed at locations that are as close to the point of discharge (for outfall locations) or the last junction[1] associated with the land area of interest (for the land use based locations). In all cases, equipment will be placed at elevations sufficient to minimize the potential for river water to back up to the sample location and compromise flow data quality, the integrity of the sediment traps and collection of true stormwater samples.

During one storm event, discrete stormwater "grab" samples will be collected from 10 locations where it is most likely that organics would be detected in water samples. Because the purpose of the grab samples is to collect partitioning rather than loading data, samples will be collected during storm periods expected to have higher COI concentrations (e.g., first flush or rising limb), to increase the likelihood of detecting low level COIs. While all samples will be analyzed for TOC/DOC constituents, the following sampling locations were selected based on general knowledge of site uses and potential sources. The following list (and in Table 2-4a) of locations was determined for this sampling:

- WR-24 – Oregon Steel Mills (PCB[2]s/phthalates)
- WR-121/123 – Schnitzer (PCBs/phthalates)
- WR-96 – Arkema (DDx/phthalates)
- WR-107 – Gasco (PAHs)
- WR-145 – Gunderson (PCBs/PAHs/phthalates)
- St. Johns Bridge – ODOT (PAHs/phthalates)

[1] The term "junction" refers to any accessible location where two or more pipes are joined by a structure such as a manhole. This may include locations where drainage from surface runoff also enters the junction, such as catch basins that connect two or more pipes.

[2] All references to PCBs throughout this document refer to the analyses of PCB congeners (as opposed to PCB Aroclors).

- OF-17 – Industrial/Residential/Open Space Land Use (PCBs/PAHs/phthalates)
- OF-22B – Heavy Industrial (pesticides, various)
- WR-161 – Portland Shipyard (phthalates)
- OF-22 – Willbridge (PAHs)

Also, all composite samples for the Terminal 4 sites will include filtered and unfiltered pairs for all chemicals analyzed including organic compounds.

5.0 WHOLE-WATER SAMPLE COLLECTION AND PROCESSING

5.1 COMPOSITE SAMPLE COLLECTION AND PROCESSING

5.1.1 Sampling Equipment

For this project, 31 Isco 6712 samplers with flow monitoring modules, sampler base and support equipment (battery charges, data modules, sampler tubs, strainers, glass jars, etc.). The samplers are composite samplers with sequential sampling capabilities. Each sampler base contains eight 1.8-liter discrete sample containers. The samplers will be programmed to collect flow proportional discrete samples (see Section 5.1.1.2).

Teflon suction tubing, silicon pump tubing and glass bottles will be used in all locations. Sample probes will be attached to a stainless steel plate. The plate will be bolted using concrete bolts to the bottom of the pipe. Hoses and electrical cords will be attached to the side of the pipe and manhole using concrete bolts and plastic ties. The sampler will be hung from the manhole rungs using stainless steel cable and iron hangers. Additional information on the sample equipment is provided in Appendix A.

5.1.1.1 Sampler Decontamination Procedures

Any portion of the tubing, pump, filters, and Isco sampler or other materials coming into contact with sampled stormwater will decontaminated prior to use or certified pre-cleaned from the equipment source. Appendices A and B contain detailed procedures and equipment material requirements to avoid potential contamination of samples. These procedures are summarized below.

The top cover, center section, retaining ring, and tub of the automatic sampler will be cleaned with warm soapy water and rinsed with tap water. The two pump drain holes will be checked to see that they are open and free of debris or buildup.

The sampler intake tubes and screens will be cleaned and stored until they are deployed using the decontamination procedure in Appendices A and B. During implementation of the FSP, it is not anticipated that screens and intakes tubes will be removed for cleaning between sampling events. The sampler will be programmed to purge the intake tubes several times before and after each stormwater sample is collected, which should ensure that any contamination from previous events is removed or sufficiently diluted to be unimportant. If upon routine inspection, it is observed that algae is growing in the intake tube, debris is blocking the tube, or any other gross contamination issues may exist, it will be replaced with a tube and screen decontaminated per Appendices A and B.

The Teledyne/Isco glass sample bottles will be sent to the analytical lab for cleaning and returned to the LWG Field Laboratory for deployment. The procedure for these bottles is described in Appendices A and B.

Mounting equipment such as slip rings, nuts and bolts, brackets will be washed with warm soap water using a brush to remove any oil, grease, or other residue from the manufacturing process. They will then be rinsed with spectro-grade acetone and then with tap water and allowed to dry. A warm oven could be used to speed drying.

When installing the brackets in the field at the sampling sites, it may be necessary to drill holes or use powder actuated tools to set studs, weld, or use other means to attach the sampling hardware that may create some debris that could become a contaminant source. After the studs are set or other procedures are complete, the work site will be scrubbed with a brush to remove any debris and rinsed with deionized water before the sampling hardware (intake screen) is mounted.

All sampling equipment and containers will be prepared prior to the sampling event. Prior to installation, all automatic sampling equipment (Isco sampler head, Teflon suction tubing, strainers, silicone tubing and all other sampling equipment, except glass sampling jars), will be decontaminated according to the Equipment Decontamination Procedures provided in Appendix A.

After the equipment has been installed and used, the Isco sampler head (silicon tubing only) and Isco base will be decontaminated at the lab using the same steps, but the Teflon tubing will be left in place at the sample station and rinsed with 1 gallon of laboratory pure water between each sample event or during routine maintenance. After each sampling event, the sampler silicon pump tubing will either be replaced with a new silicon hose or a laboratory decontaminated silicone hose. In addition, the base of the sampler will be replaced after each sampling event with a different base containing sampling jars that have undergone decontamination according to the SOP in Appendix A.

Equipment rinsate blanks will be performed by running DI (reagent grade) water through a decontaminated Teflon sampler hose, strainer and silicone pump tube installed in the sampler, into pre-cleaned sampler containers until sufficient volume is collected to run the analytes of interest (see Section 10.2 and Field Quality Control Procedures in Appendix A).

The laboratories listed in Table 2-5 will provide glass containers for collecting samples. Glass containers and jars will be pre-cleaned according to laboratory SOP (Appendix ?). Certification information is kept at the laboratory and is available for review at any time. The sample procedures are used for cleaning sampling equipment and containers for SIM analysis. The containers will be certified to the detection limits of this project (Table 2-6b).

5.1.1.2 Sampler Activation and Programming Protocols

The samplers and their programs will be activated using one or several activations protocols including time, height of water, velocity of water, or flow rate. The activation protocols are dictated by type of sample to be collected and site conditions, and are therefore site specific for each location; site specific settings are provided in Appendix ?. Flow proportioned discrete samples will be collected as long as the programmed activation protocols are met or until all the containers are full. A complete sampling event would result in 8 1.8-liter bottles being filled over the first 24 hours of the storm or 75 to 100 percent of the storm hydrograph.

Once the sampler is activated, the sampler will be programmed to collect discrete/sequential flow proportional samples. Samples are taken flow-proportionally based on the flow proportional sampling criteria set (e.g., every 50,000 gallons). Thus, every x gallons of water discharged, a discrete sample of approximately 200 to 250 ml is taken. Four samples are composited into each discrete sample container. A complete sampling sequence would be 48 samples filling 8 1.8-liter containers. A minimum volume of 3 to 6 liters (12 to 24 aliquots, depending on the QC that is being performed) is required to perform the selected analyses.

The frequency of the flow proportional sampling is dependent on the magnitude of the storm and the flow in the pipe. At times, flow proportional sampling criteria will be adjusted based on the magnitude of the storm that is being predicted. For example, a small storm may not achieve the necessary volumes to trigger enough sampling to meet the minimum volume criteria to perform the necessary analysis or a large storm may fill the sample containers in a very short period (not representative of the storm event) of time if the flow proportioning is set too low. For all sampling conditions, the samplers will be programmed to perform one pre-flush prior to taking a sample.

5.1.1.3 Sampler Maintenance

Are samplers going to remain in the field for the duration, or will they be returned to the lab? Will maintenance occur in the field or in the lab? What happens when a sampler develops mechanical problems? How often will samplers be maintained?

5.1.2 STORMWATER SAMPLE COLLECTION AND PROCESSING

5.1.2.1 Stormwater Event Criteria and Frequency

At each of the outfalls listed in Table 2-1, three stormwater samples are to be collected during storm flow conditions in the 2006/2007 wet-weather season (October 1 through May 31). Generally, the samples will be attempted to be collected whenever conditions present themselves in order to obtain three stormwater samples within this wet-weather season during storms that meet the acceptable precipitation event described below.

An acceptable precipitation event is defined as follows:

- Total precipitation of at least 0.2 inches over a minimum of a 3-hour period.
- Less than 2.25 inches in a 24 hour period (equivalent to the 2-year event).
- Less than 0.1 inches of precipitation in the previous 24 hours (an antecedent period of 24 hours).

Note: Measure rainfall amounts that are greater than six hours apart are considered separate storm events and samples from these events will not generally be composited as a single storm event.

The above criteria should be considered goals. Each event sampled will be evaluated in meeting these goals but circumstances may arise where all these goals cannot be met. In that event, EPA and DEQ will be contacted to discuss any sampling conditions that do not meet the sampling criteria prior to analyzing the samples. The justification for accepting samples that deviate from these criteria will be provided in the Field Report.

National Oceanic and Atmospheric Administration (NOAA) storm predictions will generally be used in the evaluation of storms potentially meeting these criteria (http://www.wrh.noaa.gov/forecasts/graphical/ sectors/pqrWeek.php#tabs).

The flow composited sample will represent no less than 75 percent of the total volume of the storm or the first 24 hours of the storm, whichever is less, and contain a minimum of 10 aliquots for compositing. The flow composite sample must be collected for a total duration of at least 2 times the time of concentration for that outfall. The duration of sampling may be the addition of two separate runoff peaks as long as the peaks are less than six hours apart, ending to beginning. If the storm peaks are more than six hours apart, only the first peak will be used for analyses. Subsequent peaks will be considered separate events and will not be included in the composite sample.

5.1.2.2 Stormwater Sampling Protocols

Name will monitor the rain gauge at the *location*; once the required amount of dry weather is achieved, *name* will go on “Storm Watch.” When weather forecasts indicate that a storm is coming that may meet the required minimum precipitation, samplers will be deployed ahead of the predicted storm. The samplers will be programmed to stay in the manhole for up to 7 days monitoring water height and flow velocity, and then activate and sample for up to a 24-hour period from the time sampling conditions are satisfied and the first sample is taken. The bottle kit will be filled with ice upon deployment and replenished on a daily bases (every 24 hours) until a storm is captured or the sampler is otherwise retrieved.

The samplers will be programmed to sample anytime storm drain conditions indicate that runoff is occurring, which is dependent on the velocity and height of water within the pipe. The samplers will be recovered 20 to 24 hours after it begins raining or sooner if the rain stopped and no additional rainfall were predicted within the sampling window from the beginning of the rainfall. When the samplers are removed, the end of the Teflon suction line which remains in the manhole will be capped with tinfoil until it is reattached to the sampler. After sampler retrieval, samples will be capped with screw closures and kept cool during transport from the field to the laboratory by replenishing ice, if necessary.

5.1.2.3 Stormwater Sample Processing

After the sampler is delivered to the laboratory, the storm data would be downloaded from the samplers. Data will be downloaded electronically from the samplers and transferred to a desk top computer for data analysis using the manufacturer supplied software. The data will be reviewed to determine the flow hydrograph and where on that hydrograph samples were taken. The storm data will be compared to the storm criteria to determine if the samples are representative of the storm. The Quality Assurance Manager (*Name*) or his/her designee will determine whether the samples meet the sampling criteria, and which of the discrete samples will be composited for analysis. The following criteria will be used to determine the acceptability of storm flow water samples:

- Sufficient Sample for Analysis. The samples will be checked to determine if there are adequate sample aliquots and volume for analysis.

- Review Rainfall Data and Criteria. The total rainfall and antecedent dry weather period will be determined to see if the minimum sampling criteria were met using data from the *Name* rainfall gauge located *location*.

- Review Flow Hydrograph, Sample Collection (time & number), and Storm Criteria. The Project Coordinator (Mr. Stivers) will determine which of the discrete samples should be composited by reviewing the flow hydrograph, the discrete sampling times relative to storm flow.

The storm hydrograph will be evaluated to determine the number of aliquots collected (i.e., minimum of 10 aliquots for compositing) and which of the discrete samples will be composited to best represent the storm criteria (i.e., minimum of 75% of the hydrograph volume, or 24 hours). The time and number of discrete samples to be composited will be compared to the storm criteria to determine if the composite is representative of the storm runoff. The LWG will forwards and discuss the representativeness of the discrete samples selected for compositing with EPA and DEQ; however, it should be noted that laboratory holding times will be in effect and decisions must be made in a timely manner.

All samples will be kept cool and preserved within 30 hours from the start of sampling. For this project, no preservatives will be added in the field. All preservatives will be added in the laboratory once the discrete samples are combined to form the flow-weighted composite sample to represent the portion of the storm of interest. The samples will then be split out for the different analytical parameters. Preservations will then be added appropriate for the analysis parameter to be performed (e.g., metals nitric acid, etc.) according to the laboratory's SOP (see Appendix ?).

Once samples are accepted at the laboratory, the laboratory's SOPs for sample handling and storage will be followed (see Appendix ?). Sample container and storage requirements are presented in Tables ____. After analysis, remaining sample will be archived according to the laboratory's SOP. The remaining sample is kept cool (4°C) and retained for 6 months beyond issue of the laboratory report.

After compositing, each sample container will be clearly labeled with the project name, sample identification, date and time of first aliquot collected that is used in the composite, initials of person(s) preparing the sample, analysis specification, and pertinent comments such as preservatives present in the sample. A sample analysis request form (see Appendix E) with the date and time of the first aliquot collected that is used in the composite will be generated indicating holding time constraints per the laboratory's SOP for sample login and tracking. The sample analysis request form will be used by the analyst in performing the appropriate analyses for the sample.

5.2 GRAB SAMPLE COLLECTION AND PROCESSING

5.2.1 Sampling Equipment

5.2.1.1 Sampler Decontamination Procedures

5.2.1.2 Sampler Maintenance

6.0 IN-LINE SEDIMENT SAMPLE COLLECTION AND PROCESSING

Sediment traps will be installed at each sampling location immediately upstream of the outfall discharge and downstream of the automatic sampler. Figure 2-2 presents a photograph of a prototype of the sediment trap that will be deployed. The sediment trap will be placed adjacent to the outlet of the stormwater facility with the opening of the collection bottle at the same elevation as the invert of the outlet. Some sampling locations may require the use of sandbags or structural modifications to generate flow conditions conducive to sediment trap sampling. The sediment traps will be deployed at each location for a minimum target period of 3 months. Sediment traps will be installed by field crews that are certified for confined space entry using the procedures provided in Appendix H. The LWG will notify EPA and DEQ prior to deployment of the sediment traps.

Sediment traps will be inspected at a minimum on a monthly basis. When inspected, if the collection bottle more than half full of sediments, the bottle will be capped with screw closures, removed from the mounting brackets, packaged and placed on ice in coolers for transport to the laboratory (see Table 2-5) to be archived. An empty collection bottle will then be placed in the trap. If the collection bottle is less than one third full at the first monthly inspection, options for repositioning or relocating the equipment or adding additional traps to obtain a better collection rate will be considered.

At the end of the deployment period, the collection bottles will be capped with screw closures, removed from the mounting brackets, packaged and placed on ice in coolers for transport to the laboratory (see Table 2-5). The samples will be cooled with ice/blue ice that is enclosed in a second plastic bag to prevent contact and possible contamination from the ice (tap water). Processing will begin as soon as possible after each sample is retrieved. At the laboratory, all sediments for each location will be combined and homogenized using stainless steel utensils. These utensils will be cleaned prior to use in accordance with the laboratory SOP.

Sediment trap collection bottles will be one liter Boston Amber glass bottles with Teflon lined lids. All sub-sample containers will be glass jars with Teflon lined lids, cleaned to EPA QA/QC specifications *Glassware Cleaning Following EPA Protocols*. The sediment sample analysis will be conducted in accordance with the hierarchy as listed in Table 2-4b.

Once samples are accepted at the laboratory, the laboratory's SOPs for sample handling and storage will be followed (see Appendix ?). Sample container and storage requirements are presented in Tables ____. After analysis, remaining sample will be archived according to the laboratory's SOP. The remaining sample will be kept frozen and retained for 6 months beyond issue of the Quality Assurance Data Summary Package.

7.0 SAMPLE DOCUMENTATION

7.1 FIELD LOGBOOK AND FORMS

All field activities and observations will be noted in a field logbook during fieldwork. The field logbook will be a bound document containing individual field and sample log forms. Information will include personnel, date, time, station designation, sampler, types of samples collected, and general sample and runoff observations. Any changes that occur at the site (e.g., personnel, responsibilities, deviations from the FSP) and the reasons for these changes will be documented in the field logbook. Logbook entries will be clearly written with enough detail so that participants can reconstruct events later, if necessary. The following data will be included in the field logbook:

- General filed observations at retrieval including, but not limited to, weather conditions, presence of other activities in the area, and any factors which may affect the quality of the data.
- Date and time of sample collection.
- Names of field coordinators and person(s) collecting and logging in the samples.
- Observations made during sample collection.
- For the whole-water samples, a general description of the sample set including color, odor, and presence of an oil sheen.

A sample collection checklist will be completed following sampling operations at each station. The checklist will include station designations, types of samples to be collected, and whether field replicates/duplicates, rinsate blanks, or additional sample volumes for laboratory QC analyses are to be collected. A set of field log forms is included in Appendix E.

7.2 SAMPLE TRANSPORT AND CHAIN-OF CUSTODY PROCEDURES

8.0 ANALYTICAL PROCEDURES

Stormwater and sediment samples will be analyzed as described below. Table 2-5 summarizes the analytes, methods, and reporting limit goals of analysis for each analyte group for each sample type (sediment and stormwater). Storage and preservation requirement for water and sediment samples are provided in Table 3-3. Table 4-2 lists the percent recovery and percent RPD for the water and sediment analytes. Table 2-3 lists the minimum sample quantities and priority or analysis.

Unless otherwise indicated, all analyses will be performed by the laboratories listed in Tables 2-5a and 2-5b. EPA and DEQ will be notified in advance of any proposed changes in analytical laboratory and the name of the lab to be used. The LWG will only use another lab if time constraints for analyses are an issue. EPA and DEQ will be notified if the LWG cannot meet the 45-day turn-around time for the Quality Assurance Data Summary Package for chemistry.

8.1 WHOLE WATER ANALYSES

The stormwater samples will be analyzed for pH, conductivity, turbidity, and temperature in the field. Stormwater samples will be analyzed at selected chemical laboratories for conventionals, metals, and organic parameters as summarized on Table 2-5b. It is anticipated that sufficient sample volume (as noted in Table 2-3) will be collected during each stormwater event to conduct all analyses listed in Table 2-5b. The specific analytes for each parameter group and the analyte concentration goals (ACGs) are included on Table 2-6b. Table 2-2 shows the number of natural samples and identifies the QA/QC samples for each sampling event. A Quality Assurance Project Plan (QAPP) Addendum for the Round 2A QAPP (Integral and Windward 2004) for this investigation is presented under separate cover. The QAPP Addendum summarizes the analytical program and provides details on the laboratory methods, QA procedures, and QA/QC requirements.

8.2 IN-LINE SEDIMENT ANALYSES

The in-line sediment samples will be analyzed at selected chemical laboratories for conventionals, metals, and organic parameters as summarized on Table 2-5a. The analytes are listed in the priority for analysis in Table 2-3. If sufficient mass (as shown on Table 2-3) is not available to complete all analyses, the analyses will be conducted by the laboratory in the priority order identified in this table. Any additional mass available will be used for laboratory quality control analyses (matrix spike samples, laboratory duplicate samples, matrix spike duplicate samples). The specific analytes for each parameter group and the ACGs are included on Table 2-6a. Table 2-2 shows the number of natural samples and identifies the QA/QC samples for each sampling event. A QAPP Addendum for the Round 2A QAPP (Integral and Windward 2004) for this investigation is presented under separate cover. The QAPP Addendum summarizes the analytical program and provides details on the laboratory methods, QA procedures, and QA/QC requirements.

8.3 SEDIMENT TRAP SAMPLE CLEANUP PROCEDURES

9.0 DATA REDUCTION, REVIEW AND REPORTING

9.1 FIELD REPORT

9.2 QUALITY ASSURANCE DATA SUMMARY PACKAGE

9.3 DATA ANALYSIS

9.3.1 Assumptions

9.3.2 Maximum Detectable Change in Contaminant Concentrations

9.3.3 Summary Statistics

9.4 FINAL REPORT

10.0 QUALITY CONTROL PROCEDURES

10.1 LABORATORY QUALITY CONTROL

10.2 FIELD QUALITY CONTROL

10.3 EQUIPMENT RINSATE BLANKS

11.0 PERFORMANCE AND SYSTEMS AUDITS

12.0 PREVENTIVE MAINTENANCE

13.0 DATA ASSESSMENT PROCEDURES

14.0 CORRECTIVE ACTION

15.0 QUALITY ASSURANCE REPORTS